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near the permanent dwelling, and is almost always surrounded by cane-fields. The cane-mill is equipped with what may be termed the mill proper, consisting of a pair of large and very heavy rollers with a large hand-wheel used in turning them, the large storage pots for fermenting the cane juice, and the fireplace and pottery still used in distilling the rum made from the fermented juice. The similarity which such a mill bears to an ordinary dwelling is shown in pls. I, II, in each of which the structure to the right is the mill, and that to the left the dwelling. These two illustrations show also how close together the mill and the dwelling are sometimes built. In pl. VI is shown an isolated mill, with a field of young cane in the background. The dwelling of the owner of this cane-mill, illustrated in pl. V, is situated directly opposite on the bank of the river.

The three classes of buildings described are generally isolated from others. The continuously inhabited dwellings are never assembled into villages, but are scattered at intervals along the banks of the stream. There are, however, within the Cayapa territory, three villages, each consisting of a church and a number of houses. These villages are used by the people only when they come together for religious feasts and on other festival occasions. The houses in these villages are never occupied regularly except at such times, though they are constructed in every way like the dwellings occupied permanently by the people as homes.

The church, which of course is a modern institution, having existed only since the time of the Spanish con-

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rodents, and bats. Furthermore, the plantain has a much superior flavor when gathered green and ripened in a shady and fairly cool place. If allowed to ripen on the plant, the Indians claim that it is insipid.

The banana, which in some respects can hardly be distinguished from the plantain, is cultivated and harvested in precisely the same manner. Of this fruit there are three species: a large yellow, a small yellow, and a small red species; but they are almost never used as human food, being cultivated in nearly as great quantities as are plantains for the purpose of feeding the hogs, of which the Cayapa raise considerable numbers.

Sugar-cane, though introduced, has a native Cayapa name, e'lla, and is one of those products at present most grown by the Indians. Often immediately adjacent to the dwelling, and always within a short distance of it, is a cane-mill and distillery, called tapī'tcī ya or ta'pī ya, usually surrounded by comparatively large fields of cane, which thrives especially in low, wet ground. In pls. I, II, are shown cane-mills which are immediately adjacent to the houses of their owners, and to the right in each case glimpses of the adjacent cane-fields may be had. In pl. VI is shown an isolated mill, flanked by its field of young cane. This mill is situated directly across the river from the dwelling of its owner.

After the original planting, a few months only are required before the cane is sufficiently mature to be cut. There are no regular times for the harvesting of the cane, which is usually governed by the necessity for a new

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supply of rum. When it is deemed best to replenish the rum supply, the whole family goes to the cane-field, and each with a machete and a hooked stick about three feet long, clears the field of all weeds and vines, and cuts as much of the matured cane as is needed. The stalks of cane are always cut close to the ground, and all the leaves are stripped off. The butt end of the stalk is then cut diagonally so as to leave a markedly beveled point, which facilitates its insertion between the rollers in grinding. This beveled cut is well illustrated at the lower end of the stalk of cane shown in pl. xv. This is a picture of Antonio Napa, or Pi′tcū apa according to his Cayapa name, chief of the Punta Venado division of the Cayapa, at work in his cane-field, and exhibits a field of cane in process of harvesting. All the cane leaves which are stripped from the stalks, together with the vines and undergrowth, are carried to the side of the field and thrown into the brush, since if they were left on the ground, the vines especially would soon take root and grow as rapidly as before. As the mill is ordinarily immediately adjacent to the field, the cane is carried to it usually upon the shoulders of the harvesters. If, however, it is situated at a distance of several hundred yards, the cane is generally carried to the bank of the river and thence transported by canoe to the mill. The stalks, cut usually into lengths of from four to six feet, are piled in a large rick in front of the rollers used for grinding. As shown in pl. LXIV, the cane may first be corded up on the ground in front of the mill, and later put on the floor in front of the rollers.

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274 The mill proper, called tapī′tcī, from the Spanish trapiche consists of two heavy rollers, usually about fifteen inches in diameter by thirty inches in length. These rollers, which are called by the same name as the entire mill, are set horizontally in a heavy upright frame and are usually at a height of about four feet from the floor. The upper roller is the continuation of a heavy squared shaft, from ten to fifteen feet in length, at the opposite end of which is a large wheel, called tapī′tcī lyú′mī, sometimes as great as sixteen feet in diameter. This wheel as a whole really consists of two wheels of equal diameter which are set at a distance, along the horizontal bar, of from two to three feet from each other. Each of the separate wheels comprising the large wheel consists of spokes in the form of cross-bars that pass through the squared shaft and at right angles to it, and of a rim made from one of the many species of large vines common to the region. The rims of these component wheels are joined by many horizontal bars which complete the wheel as a whole and which serve as hand-holds in propelling the wheel. The upper and lower rollers have in turn each a set of cogs by means of which, when the upper roller is turned by the force exerted upon the wheel, the lower one is turned correspondingly in the opposite direction, thus drawing the cane between them and crushing it. Usually several persons are required at the wheel in order to drive the rollers. One person, usually a woman or a child, feeds the cane into the rollers, and another receives the cane on the opposite side. A single stalk of cane is fed at a

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UTENSILS FOR MAKING RUM

BARRETT—CAYAPA INDIANS

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PL. LXIV

SUGAR-CANE STACKED BESIDE THE MILL

[p. 84-(n)]

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time, and each is followed immediately by the beveled point of the next stalk. Below the rollers and between the uprights which support the whole mechanism is placed a large canoe-shape wooden trough such as that shown in pl. LXIII, or in pl. LXV, into which the cane-juice flows. In case there is no such special wooden trough at hand, or the regular trough is otherwise in use, a small canoe is carefully washed out and used instead. When necessary, leaves of the hoja blanca or of the plantain are placed at the sides of this receptacle in order to prevent the juice from falling or splashing outside. These leaves are especially necessary when, as occasionally happens, a large pot instead of a trough or a canoe is used as a receptacle for the juice; in such an event a funnel is usually built up with leaves above the mouth of the pot.

When the whole rick of cane-stalks has been ground in this manner, the motion of the rollers is reversed, wedges are driven into spaces above the bearings of the uppermost roller in order to bring the two rollers more closely together, and the cane is rolled a second time. During this part of the process, however, two or three of the previously crushed stalks are placed one upon another and almost as much juice is pressed from each as was obtained in the first rolling. As the stalks are received from the rollers the second time, they are quite devoid of juice and are thrown out on the ground. Thus in front of each mill is heaped a large mound of cane trash, such as that shown in front of the mill in pl. VI.

During the grinding of the cane a large copper kettle,

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called pai'la, is kept filled upon a fire in another part of the building, and the juice is here boiled as rapidly as it comes from the rollers. This boiling is allowed to continue for from ten to twenty minutes, during which time the froth which rises to the top is skimmed frequently with a special perforated dipper or skimmer, usually attached to a long handle and called ci'cûlya, or with a large calabash spoon called ci'ê-kûtcada, the latter part of which term is from the Spanish cuchara, "spoon." When the juice has reached the stage where it boils without producing froth, this part of the process is considered finished; it is then dipped out of the kettle with a long-handled calabash dipper like that resting across the end of the canoe-shape wooden trough shown in pl. LXIII, and that in pl. LXV, and called sê'mbê or i'ckala pi cûlnuntsûmi, and is placed in one of the large canoe-shape wooden receptacles above mentioned, where it is allowed to cool for several hours. When thoroughly cooled it is put away to ferment in large pottery vessels, or ollas, of the form shown in pl. LXXXVII, 11. Several thicknesses of the leaf of hoja blanca are placed over the opening of such a pot and tightly bound about the rim. The juice is then allowed to ferment for from two to three weeks, when it is ready for distillation. The boiling and subsequent cooling of the juice before placing it in the ollas is said to be necessary to prevent souring.

Usually a sufficient quantity of the juice, called by the Spanish name guarapo, rendered wa'pû in Cayapa, is prepared at one time to fill several large ollas. While

STILL, CANOE-SHAPE DISH, AND DIPPER

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fresh from the rollers, as well as after boiling, in fact at any stage before it begins to ferment, the juice is called pī′ wapū, literally "water guarapo," in contradistinction to the fermented juice, which is called sa′wapū, meaning "sour guarapo." The ollas referred to are especially made for the purpose, and are the most difficult work of the potter, as their size renders them not only inconvenient to form and handle while drying, but makes them also extremely hard to fire. They are almost invariably coated inside and out with brea (Cayapa, amū′ya), the wax of a small bee, which renders them impervious and prevents waste through seepage. The bases of these large vessels are comparatively small, therefore to prevent them from tipping, each is set upon a ring made of refuse cane. When sugar-cane was first introduced among the Cayapa, rum was not made, but the fermented guarapo was much drunk, and even at the present time considerable quantities are so used. To be sure, it is by no means so intoxicating as rum itself, but after it has fermented for two to three weeks it contains a considerable proportion of alcohol. The fermented guarapo is drunk not only about the home and during the process of distillation, but also to a certain extent at fiestas, to which it is brought in large ollas and consumed in place of rum and by some in preference to it.

The guarapo is finally distilled in order to produce the concentrated alcoholic beverage known by the Spanish name aguardiente and called by the Cayapa i′ckala. The still used in this final process is illustrated in pl. LXIII, from a photograph made while the distillation was in

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progress, and in pl. LXV from a drawing so made as to show the wooden "worm" as well as the outside of the still. Such a still is composed of five parts. Three of these consist of (1) a large olla of the form shown in pl. LXXXVII, 7, which serves as a caldron and which is supported over the fire by three stones; (2) a second olla or vaporizer which surmounts the caldron and which is of the form shown in fig. 10 of the same plate; and (3) a flat, inverted cone of copper which rests in turn upon the vaporizer. This copper top, called i'ckala lanō pai'la, as also the large copper kettle used in reducing the cane juice by boiling, is obtained through trade. These appliances are manufactured chiefly by metal-workers in Quito, and both are highly valued by the Cayapa largely because of the difficulties of transportation from Quito to the Rio Cayapas. The upper olla, or vaporizer, called kandyī-hū'lū, is without a bottom and therefore forms a large chamber into which the vapor from the boiling guarapo in the caldron below rises and comes into contact with the inverted copper cone, which is kept constantly cool by frequently changing the water in it. The vapor condenses on the under surface of this copper vessel, runs down to the point of the cone, and drips on a flat grooved board, called kandēlē'hō or kandyīhūlū ta''pa, which forms the fourth element of the still, and which serves in a way the same function as the worm in the still used by civilized peoples. Its position and its relation to other parts of the still are well shown by the drawing in pl. LXV. This "worm" conducts the liquid out through an opening in the side of the vaporizer and

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part way through a bamboo tube, called i'ckala lanō pa'kkī, the fifth element of the still, down which the liquid finally runs to a small bit of cotton at its outer opening. This cotton is brought to a point at its lower end and serves to conduct the liquid directly to a receptacle, usually a bottle, below. Quite naturally it is necessary that the entire apparatus have joints which are practically air-tight in order that the vapor shall not escape. To effect this, all the joints are filled with scraped, green plantain, which, becoming heated as the caldron begins to boil, firmly cements the parts of the still together.

This apparatus for distillation requires constant attention. The fire must be kept carefully under the caldron and must be neither too hot nor too cool. If too hot, the guarapo will boil up into the vaporizer and pass out through the tube; thus in a few seconds a bottle of rum may easily be spoiled by being mixed with a small quantity of the guarapo. Also, the water in the copper top must be changed frequently in order to keep the top itself cool enough to condense the vapor on its surface. Water is kept usually in a large canoe-shape wooden receptacle near the fire-box, as shown in pl. LXV. The long-handled calabash dipper, above mentioned, is used to remove the heated water from the copper top and to replenish it with cold. When care is exercised in the boiling and the cold water is replenished at proper intervals, the rum passes down the cotton tip into the receptacle in a small but constant stream. A caldron containing from ten to fifteen gallons of guarapo yields from four to six quarts of clear liquor and requires from

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274 two to three hours in its distillation. This liquor is as clear as water, has a very pungent odor, a vile flavor, and contains from ten to twenty per cent of alcohol. The distillation of four or five caldrons of quarapo is considered a good day's work.

According to Cayapa belief, the success of a distillation does not depend entirely on the care with which the boiling is done. In transferring the guarapo from the storage pots to the caldron, a small pot, such as that on the fire-box shown in pl. LXV, with a capacity of a gallon to a gallon and a half, is used. With a hemispherical calabash dipper, or mate, such as that shown in fig. 13, the guarapo is first dipped from the storage pot into this smaller vessel and is then carried to the caldron. The pouring of it into the caldron, however, is a most important matter, since certain people have "much better hands" than others. That is to say, if the guarapo is poured into the caldron by a person with a "good hand," the yield of that caldron may be increased even as much as two or three quarts of rum over the yield resulting if it is poured by someone else. It is a common practice to honor a guest who happens to come during a distillation by inviting him to pour the guarapo into the caldron. Especially is this done if he has the reputation of having a "good hand." In such a case it is customary to bring the pots of guarapo to him. He receives them at the caldron and pours in the contents.

As before stated, the rum is usually caught from the spout in bottles, although it is almost immediately poured into a large storage vessel, usually a demijohn,

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of from five to ten gallons capacity. To use the large demijohn as a receptacle directly at the spout would endanger a large quantity of rum, for whenever a caldron boils over it is necessary to return the mixed rum and guarapo to the next caldron to be distilled.

When the boiling of a caldron first begins, the product is much purer than later in the process. No fixed length of time can be given for the distillation of a caldron, since the strength of the rum must be determined by testing each bottle as it is filled at the spout. The whole process, therefore, is one of fractional distillation, the strongest of the rum coming off in the first bottle taken from any given caldron. When at last the rum becomes sufficiently weak, it is considered that the distillation of that particular caldron has proceeded far enough and it must then be refilled with fresh guarapo.

Before refilling the caldron, the fire is first drawn from under it. A mouthful of water is then spurted in a small stream upon the now hard and dry plantain which cements the parts of the still together, thus softening it and permitting the parts of the still to be separated. The copper top is given a thorough cleaning and is scoured with ashes until bright, and the upper pot, or vaporizer, is also cleaned if necessary. The guarapo remaining in the caldron is dipped out with a long-handled dipper, and the caldron is finally refilled with fresh guarapo. If the result of the last distillation has been very successful, it is believed that the hand of the person who poured the guarapo into the caldron still holds its "luck," and he is usually expected to fill the

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caldron a second time. If, however, a contrary result has been effected, someone else will usually "try his hand." The whole process of rum-making is one in which the women do fully as much work as the men, and they also have "lucky" and "unlucky" hands in distillation.

Usually the ordinary distillation above described is considered sufficient. If, however, an exceptionally good rum is desired, as for use at certain feasts, a special process of fractionation is resorted to and the product of the ordinary distillation is redistilled. A special flavor is imparted to the rum at this time by putting into the caldron with it several of the large leaves of an aromatic herb which abounds in the region and which possesses an anise-like odor and flavor.

As previously stated, the chief use of sugar-cane is for making rum, but, as before described in speaking of foods, the Cayapa occasionally make syrup and also a kind of preserves. On the other hand, they never make sugar, as do the negroes of this region. Much raw cane is also chewed. The fibrous though tender stalk is, of course, not swallowed, but it yields a large quantity of rich, sweet juice which is highly relished. The cane is also frequently roasted in the coals; and in boiling cane-juice to make guarapo for distillation, stalks of raw cane are frequently cut up and thrown into the kettle to boil with the juice. The result of either the roasting or the boiling is a rich food with a flavor resembling that of maple, and is even more palatable than the raw cane.

Cacao (Cayapa, kaka'bō), from which chocolate is made, is extensively grown by the Cayapa, although

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freshing and is drunk with much relish by the Indians. The seeds themselves are spread upon mats on the drying platform of the house and are carefully watched during the next couple of weeks to prevent them from being wet by the frequent rains. After this period they are sufficiently dry to be stored away until the next trip down the river, when they are sold to traders. Cacao is one of the most important exports of Ecuador, whose territory is the source of a considerable part of the chocolate of commerce.

Although the Cayapa cultivate so much cacao, they drink it only now and then, usually at fiestas. It is prepared by first thoroughly grinding the dried cacao upon a mealing stone such as is used for grinding plantain, and then boiling. For this purpose the Cayapa make a pot of special form, such as that shown in pl. LXXXVII, 9. The boiling chocolate is stirred at intervals with an implement of special form called tcōkōla′te tcalī, illustrated in pl. LXI, 6–7. The result of this process is a comparatively thick, very rich and oily liquid, quite unlike the beverage prepared from the ordinary chocolate of commerce, since the chocolate prepared directly from the seeds as above described retains all the natural oil. It may be drunk in this form, but if sugar is available it is usually added.

Pineapples (Cayapa, tcī′lya), the only use of which is as a food, are grown to a limited extent by some of the Cayapa. The green tops of the fruits themselves are planted close together in rows, and from these the plants grow. When once established, such a plant requires

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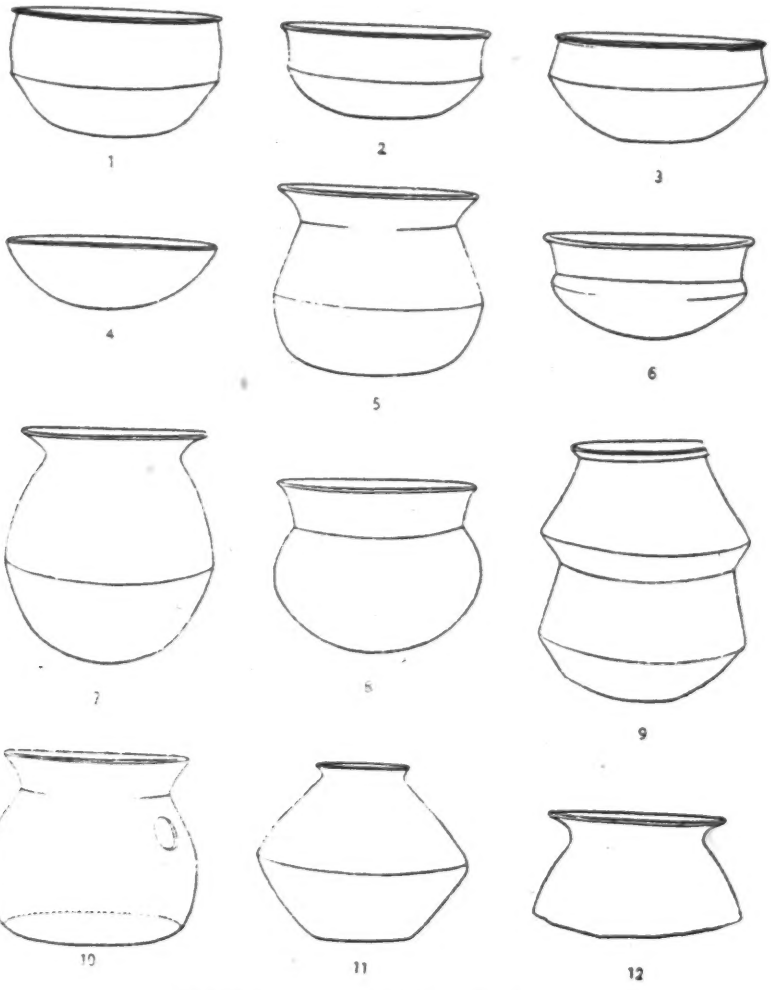

FORMS OF POTTERY VESSELS

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